

We claim:

1. A method of reconstructing a paved road, comprising:
 - taking cores of said road;
 - analyzing said cores;
 - crushing said cores to form recycled asphalt pavement particles;
 - selecting a substantially solvent-free emulsion based on climate history and application temperature;
 - mixing said emulsion and said reclaimed asphalt pavement particles to form an asphalt emulsion mixture; and
 - testing said asphalt emulsion mixture for performance using a raveling test, a thermal cracking test, a moisture susceptibility vacuum saturation test, and a dry Marshall stability test.
2. The method of claim 1, further comprising:
 - milling pavement off said road to form reclaimed asphalt pavement particles and leaving at least about an inch of said pavement on said road;
 - mixing said reclaimed asphalt pavement particles with said emulsion to form a cold in-place recycling layer; and
 - applying said cold in-place recycling layer to said road.
3. The method of claim 2, further comprising:
 - compressing said CIR layer with a roller, wherein said roller may be placed on said CIR layer up to about an hour after said layer is applied.

4. The method claim 1, further comprising:
evaluating said road before taking cores of said road.
5. The method of claim 4, wherein said evaluation includes inspecting
said road to determine if said road is thick enough to leave at least about an inch base of pavement
after milling, determining if said road has a structurally sound base, and determining if said road has
good drainage.
6. The method of claim 3, further comprising:
applying a wearing surface selected from the group consisting of a cold, hot,
or warm mix overlay, a sealcoat, a chip seal, a fog seal, or other surface treatment.
7. The method of claim 1, wherein said cores are representative of variations in
the road.
8. The method of claim 7, wherein at least two asphalt emulsion mixes are
formulated for at least two for different parts of the road having different compositions.
9. The method of claim 1, wherein said emulsion is comprised of emulsifier,
asphalt solids, and water.
10. The method of claim 1, wherein said mixture is further comprised of lime,
rock, polymer, elastomers, plastomers, other adhesion agents, and petroleum fractions or
combinations thereof.
11. The method of claim 9, wherein said emulsion is solventless.
12. The method of claim 9, wherein said emulsifier is cationic.
13. The method of claim 2, wherein said CIR layer is able to support traffic.

14. The method of claim 3, wherein said roller rolls no more than about 30 minutes behind the paver.

15. The method of claim 2, wherein said method can be performed at temperatures of at least about 50°F.

16. The method claim 1, wherein said asphalt emulsion mixture ravel no more than about 2% by weight after curing for at least about 4 hours, a critical cracking temperature that is at least as low as the possible coldest temperature of said road with 98% reliability, and said asphalt emulsion mixture has a retained strength of at least about 70%.

17. The method of claim 2, wherein about 100% of said reclaimed asphalt pavement particles are able to pass through a 1.25 inch sieve.

18. The product of the process of claim 2.

19. The product of the process of claim 3.

20. The product of the process of claim 6.

21. A CIR layer of a road that is constructed using a mix design, comprising the mixture of:

an asphalt emulsion and reclaimed asphalt pavement particles, wherein said CIR layer is designed from a mix design that ravel no more than about 2% by weight after curing for at least about 4 hours, a critical cracking temperature that is at least as low as the possible coldest temperature of said CIR with 98% reliability, and that has a retained strength of at least about 70%.

22. The layer of claim 21, wherein about 100% of said reclaimed asphalt pavement particles are able to pass through a 1.25 inch sieve.

23. A method of reconstructing a paved road, comprising:

- evaluating said road by inspecting said road to determine if said road is thick enough to leave at least about an inch base of pavement after milling, determining if said road has a structurally sound base, and determining if said road has good drainage.
- taking cores of said road;
- analyzing said cores;
- crushing said cores to form recycled asphalt pavement particles;
- selecting a substantially solvent-free emulsion based on climate history and application temperature;
- mixing said emulsion and said reclaimed asphalt pavement particles to form an asphalt emulsion mixture; and
- testing said asphalt emulsion mixture for performance using a raveling test, a thermal cracking test, a moisture susceptibility vacuum saturation test, and a dry Marshall stability test;
- milling pavement off said road to form reclaimed asphalt pavement particles and leaving at least about an inch of said pavement on said road;
- mixing said reclaimed asphalt pavement particles with said emulsion to form a cold in-place recycling layer;
- applying said cold in-place recycling layer to said road;
- compressing said CIR layer with a roller, wherein said roller may compress said CIR layer up to about an hour after said layer is applied; and

applying a wearing surface selected from the group consisting of a cold, hot, or warm mix overlay, a sealcoat, a chip seal, a fog seal, or other surface treatment.

24. The product of the process of claim 23.